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56. $\left(\frac{q}{p}\right)^{1-2x} = \sqrt{p/q}$

$\left(\frac{q}{p}\right)^{1-2x} = \left(\frac{p}{q}\right)^{1/2}$

$\Rightarrow \left(\frac{q}{p}\right)^{1-2x} = \left(\frac{q}{p}\right)^{-1/2}$

$1-2x = -1/2$

$1 + 1/2 = 2x$

$\Rightarrow 3/2 = 2x$

$x = 3/4$

57. $\left\{ \frac{a^{q-p}}{(a^{pq-q^2})^{1/q}} \times a^{2(p-q)} \right\}^n$

$\left\{ \frac{a^{q-p}}{a^{q(p-q)\times 1/q}} \times a^{2p-2q} \right\}^n$

$\Rightarrow \left\{ a^{(q-p)-(p-q)+2p-2q} \right\}^n$ $\Rightarrow a^0 = 1$

$= \left\{ a^{q-p-p+q+2p-2q} \right\}^n = \{a^0\}^n$

$= (1)^n = 1$

58. gf $a+b+c=0$

$x^{a^2b^{-1}c^{-1}} \cdot x^{a^{-1}b^2c^{-1}} \cdot x^{a^{-1}b^{-1}c^2}$ gf

$\Rightarrow x^{\frac{a^2}{bc}} \times x^{\frac{b^2}{ac}} \times x^{\frac{c^2}{ab}}$

$\Rightarrow x^{\frac{a^2}{bc}+\frac{b^2}{ac}+\frac{c^2}{ab}} = x^{\frac{a^3+b^3+c^3}{abc}} = x^{\frac{3abc}{abc}} = x^3$

59. $a^x = b^y = c^2 = abc$ then $\frac{1}{x}+\frac{1}{y}+\frac{1}{z} =$ —

Sol: let $a^x = b^y = c^2 = abc = K$

$\Rightarrow a^x = K$; $b^y = K$; $c^2 = K$; $abc = K$

$a = K^{1/x}$ $b = K^{1/y}$; $c = K^{1/2}$

$K^{1/x} \cdot K^{1/y} \cdot K^{1/2} = K$

$\Rightarrow K^{1/x+1/y+1/2} = K^1$

$\Rightarrow \frac{1}{x}+\frac{1}{y}+\frac{1}{z} = 1$

$4^5 = 4\times4\times4\times4\times4 = 256$

$3\times3\times3\times\cdots\times3$

60. $2^{3^{4^5}} = 2^{3^{256}} =$

(60) $2^{3^{4^5}} = 2^{3^{256}} =$

(61) $\frac{1}{1+x^{a-b}} + \frac{1}{1+x^{b-a}} = \frac{1}{1+\frac{x^a}{x^b}} + \frac{1}{1+\frac{x^b}{x^a}} = \frac{1}{\frac{x^a+x^b}{x^b}} + \frac{1}{\frac{x^a+x^b}{x^a}}$

$= \frac{x^b}{x^a+x^b} + \frac{x^a}{x^a+x^b} = \frac{x^a+x^b}{x^a+x^b} = 1$

62.

$\frac{2.3^{n+1} + 7.3^{n-1}}{3^{n+2} - 2\left(\frac{1}{3}\right)^{1-n}}$ $\left(\frac{1}{3}\right)^{1-n} = (3^{-1})^{1-n} = 3^{-1+n} = 3^{n-1}$

$\Rightarrow \frac{2.3^n.3 + 7.3^n}{3^n.3^2 - 2\,3^{n-1}} = \frac{2.3.3.3^n + 7.3^n}{3^n.(3^2) - 2.3^n} = \frac{18.3^n + 7.3^n}{3^n.27 - 2.3^n} = \frac{3^n(18+7)}{3^n(27-2)} = 1$

$3^n.3.3\times3$

$= \frac{25.3^n}{25.3^n} = 1$

63. $\frac{(2^{n+1})^m.(2^2)^n.2^n}{(2^{m+1})^n.2^{2m}} = 1$

$\frac{2^{nm+m+2n+n}}{2^{mn+n+2m}} = 1 \Rightarrow 2^{nm+m+3n-mn-n-2m}$

$\Rightarrow 2^{-m+2n} = 2^0$

$-m+2n = 0$

$m = 2n$

(64) $abc = 1$, $(1+a+b^{-1})^{-1} + (1+b+c^{-1})^{-1} + (1+c+a^{-1})^{-1} - \dots$

$1 \qquad 1 \qquad 1$

(64) $abc = 1$, $(1+a+b^{-1}) + (1+b+c^{-1}) + (1+c+a^{-1})$

$$\Rightarrow \frac{1}{1+a+\frac{1}{b}} + \frac{1}{1+b+\frac{1}{c}} + \frac{1}{1+c+\frac{1}{a}}$$

$$\Rightarrow \frac{b}{b+ab+1} + \frac{(c)ab}{[c+bc+1]ab} + \frac{(a)b}{[a+ac+1]b}$$

$abc = 1$

$$\Rightarrow \frac{b}{b+ab+1} + \frac{abc}{abc+(abc)b+ab} + \frac{ab}{ab+abc+b}$$

$$\Rightarrow \frac{b}{b+ab+1} + \frac{1}{1+b+ab} + \frac{ab}{ab+1+b}$$

$$\Rightarrow \frac{1+b+ab}{1+b+ab} = 1$$

65 If $x^y = y^x$ then $\left(\frac{x}{y}\right)^{x/y} = ?$

$$x^y = y^x$$

$$y = x^{y/x}$$

$$\left[\frac{x}{y}\right]^{x/y} = \left[\frac{x}{x^{y/x}}\right]^{x/y} = \left[x^{1-y/x}\right]^{x/y}$$

$$= \left(x^{\frac{x-y}{x}}\right)^{x/y} = x^{\frac{x-y}{y}} = x^{\frac{x}{y}-1}$$

$$\frac{x^a}{x^b} = x^{a-b}$$

(66) $(x^{a-b})^{a^2+ab+b^2} \cdot (x^{b-c})^{b^2+bc+c^2} \cdot (x^{c-a})^{c^2+ac+a^2}$

$$\Rightarrow x^{a^3-b^3} \cdot x^{b^3-c^3} \cdot x^{c^3-a^3}$$

$$\Rightarrow x^{a^3-b^3+b^3-c^3+c^3-a^3} \Rightarrow x^0 = 1$$

(67) $$\frac{3\cdot 2^n - 4\cdot 2^n}{2^n - 2^{n-1}} = \frac{3\cdot 2^n - 4\cdot 2^n}{\frac{2^n}{1} - \frac{2^n}{2}} = \frac{2^n(3-4)}{\frac{2^n\cdot 2 - 2^n}{2}} = \frac{2^n(-1)\times 2}{2^n(2-1)} = \frac{-2^n \times 2}{2^n}$$

$$= -2$$

(68)

$$\frac{p+p^2+p^3+p^4+p^5+p^6+p^7}{p^{-3}+p^{-4}+p^{-5}+p^{-6}+p^{-7}+p^{-8}+p^{-9}}$$

$$\Rightarrow \frac{p+p^2+p^3+p^4+p^5+p^6+p^7}{\frac{1}{p^3}+\frac{1}{p^4}+\frac{1}{p^5}+\frac{1}{p^6}+\frac{1}{p^7}+\frac{1}{p^8}+\frac{1}{p^9}} = \frac{p+p^2+p^3+p^4+p^5+p^6+p^7}{\frac{p^7+p^6+p^5+p^4+p^3+p^2+p}{p^{10}}}$$

$$= p^{10}$$

$$\Rightarrow p\left(\frac{p+p^2+p^3+p^4+p^5+p^6+p^7}{p^6+p^5+p^4+p^3+p^2+p+1}\right) = p \times p^9 = p^{10}$$

p^9

2
3
4

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Q no $\left(\frac{64}{125}\right)^{-2/3} \div \frac{1}{\left(\frac{256}{625}\right)^{1/4}} + \underbrace{\left(\frac{\sqrt{25}}{\sqrt[3]{64}}\right)^{0}}_{1}$

$\frac{q^3}{5^3}$ $\qquad$ $\left(\frac{5}{4}\right)^2 \times \frac{4}{5} = \frac{5}{4} \times \frac{5}{4} \times \frac{4}{5}$

$= \left(\frac{4}{5}\right)^{3 \times -2/3} \div \frac{1}{\left(\frac{4}{5}\right)^{1/2 \times 2}} + 1$

$= \left(\frac{4}{5}\right)^{-2} \times \frac{4}{5} + 1 = \left(\frac{5}{4}\right)^2 \times \frac{4}{5} + 1$

$= \frac{5}{4} + 1 = \boxed{\frac{9}{4}}$

Q no. 71.

$$\frac{(4)^{n+1} \cdot 2^n - 8^n}{2^{2n}} = \frac{3}{8}$$

$$\frac{(2^2)^{n+1} \cdot 2^n - (2^3)^n}{2^{2n}} = \frac{3}{8}$$

$$\Rightarrow \frac{2^{2n+2+n} - 2^{3n}}{2^{2n}} = \frac{3}{8}$$

$$\Rightarrow \frac{2^{3n+2} - 2^{3n}}{2^{2n}} = \frac{3}{8}$$

$$\Rightarrow \frac{2^{3n} \cdot 2^2 - 2^{3n}}{2^{2n}} = \frac{3}{8}$$

$$\Rightarrow \frac{2^{3n}((4)-1)}{2^{2n}} = \frac{3}{8}$$

$$\Rightarrow \frac{2^{3n} \cdot 2^{3}}{2^{2n}} = \frac{2^{3}}{8} \Rightarrow 2^{3n-2n} = 2^{-3}$$

$$2^{n} = 2^{-3} \Rightarrow \boxed{n = -3}$$

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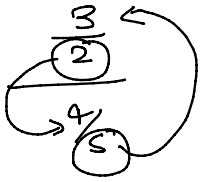
(22)

$$\frac{\left(p-\frac{1}{q}\right)^{p}\left(p+\frac{1}{q}\right)^{p}\times\left(p-\frac{1}{q}\right)^{q}}{\left(p-\frac{1}{q}\right)^{p}}$$

$$\frac{}{\left(q-\frac{1}{p}\right)^{q}\left(q+\frac{1}{p}\right)^{q}\cdot\left(q+\frac{1}{p}\right)^{p}}$$

$$=\frac{\left(p+\frac{1}{q}\right)^{p}\times\left(p-\frac{1}{q}\right)^{q}}{\left(q-\frac{1}{p}\right)^{q}\times\left(q+\frac{1}{p}\right)^{p}}$$

$$=\frac{\left(\frac{pq+1}{q}\right)^{p}\times\left(\frac{pq-1}{q}\right)^{q}}{\left(\frac{pq-1}{p}\right)^{q}\times\left(\frac{pq+1}{p}\right)^{p}}$$



$$=\frac{\frac{(pq+1)^{p}}{q^{p}}\times\frac{(pq-1)^{q}}{q^{q}}}{\frac{(pq-1)^{q}}{p^{q}}\times\frac{(pq+1)^{p}}{p^{p}}}$$

$$=\frac{p^{q}\times p^{p}}{q^{p}\times q^{q}}=\frac{p^{p+q}}{q^{p+q}}=\left(\frac{p}{q}\right)^{p+q}$$

Ans 23

(24) $x^{m^3-n^3}\cdot x^{n^3-l^3}\cdot x^{l^3-m^3}=x^{0}=1$

(25) $pqr=1$

$$\frac{1}{1+p+q^{-1}}+\frac{1}{1+q+r^{-1}}+\frac{1}{1+r+p^{-1}}$$

$$=\frac{1}{1+p+1/q}+\frac{1}{1+q+1/r}+\frac{1}{1+r+1/p}$$

$$\frac{2}{3}+\frac{3}{7}+\frac{7}{9}=\frac{1}{\frac{1+2q+q}{q}}+\frac{1}{\frac{1+3r+r}{r}}+\frac{1}{\frac{1+7p+p}{p}}$$

$pqr = 1$

$$\frac{2}{3} \times \frac{3}{3} = \frac{2}{3}$$

$$\frac{2 \times 3}{3 \times 1} = \frac{2}{3}$$

As

$$\Rightarrow \frac{q}{1 + bd + b} + \frac{r}{1 + rb + r} + \frac{p}{1 + rd + d}$$

$$\frac{q}{1 + bd + b} + \frac{(r)pq}{(1 + rb + r)pq} + \frac{(p)q}{(p + pr + 1)q}$$

$$\frac{q}{q + pq + 1} + \frac{pqr}{pqr + (pqr)q + pq} + \frac{pq}{pq + pqr + q}$$

$$= \frac{q}{q + pq + 1} + \frac{1}{1 + q + pq} + \frac{pq}{pq + 1 + q}$$

$$= \frac{q + 1 + pq}{pq + q + 1} = 1$$

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let $\sqrt{10 + \sqrt{24} + \sqrt{60} + \sqrt{40}} = \sqrt{a} + \sqrt{b} + \sqrt{c}$

$2ab$ $2bc$ $2ca$

squaring both side

$$10 + \sqrt{24} + \sqrt{60} + \sqrt{40} = a + b + c + 2\sqrt{ab} + 2\sqrt{bc} + 2\sqrt{ca}$$

$2\sqrt{ca} = \sqrt{40}$

$2\sqrt{ca} = 2\sqrt{10}$

$ca = 10$

$a + b + c = 10$

$2\sqrt{ab} = \sqrt{24} \Rightarrow 2\sqrt{ab} = 2\sqrt{6} \Rightarrow ab = 6 \quad \cdots (1)$

$2\sqrt{bc} = \sqrt{60} \Rightarrow 2\sqrt{bc} = 2\sqrt{15} \Rightarrow bc = 15 \quad \cdots (2)$

$2\sqrt{ca} = \sqrt{40} \Rightarrow 2\sqrt{ca} = 2\sqrt{10} \Rightarrow ca = 10 \quad \cdots (3)$

$(ab)(bc)(ca) = (6)(15)(10)$

$(abc)^2 = 900$

$abc = 30 \quad \cdots (4)$

eq^n (4) ÷ eq^n (1)

$\frac{abc}{ab} = \frac{30}{6} \Rightarrow c = 5$

eq^n (4) ÷ eq^n (2)

$\frac{abc}{bc} = \frac{30}{15} \Rightarrow a = 2$

eq^n (4) ÷ eq^n (3)

$\frac{abc}{ca} = \frac{30}{10} \Rightarrow b = 3$